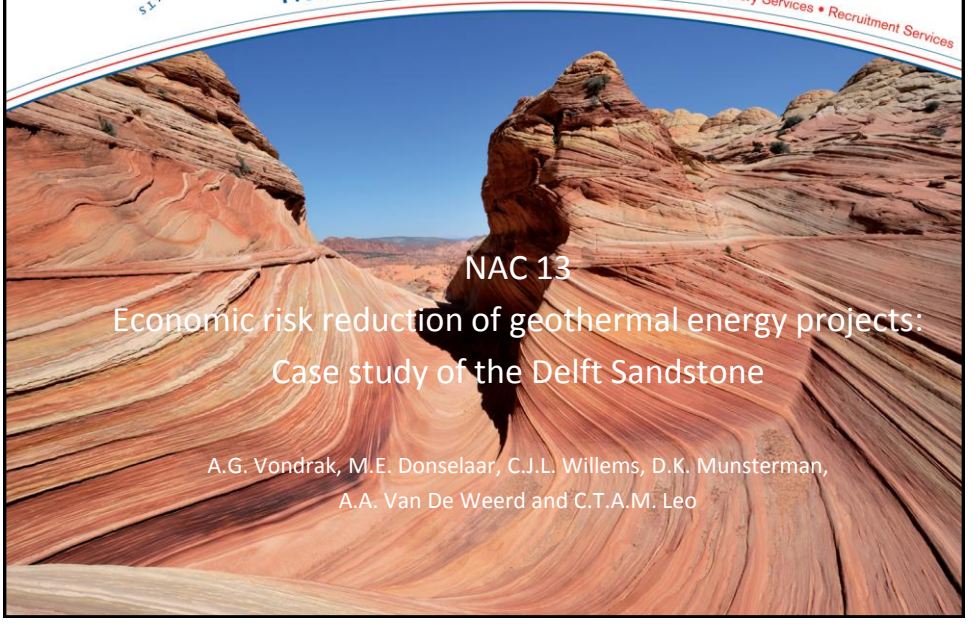
From data to solutions • Subsurface Evaluations • Laboratory Services • Recruitment Services



NAC 13

Economic risk reduction of geothermal energy projects: Case study of the Delft Sandstone

A.G. Vondrak, M.E. Donselaar, C.J.L. Willems, D.K. Munsterman, A.A. Van De Weerd and C.T.A.M. Leo

Geothermal energy

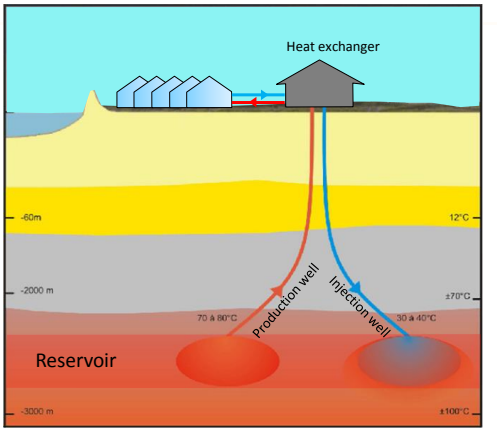
- Green energy
- First project in 2007
- Costs 15 million
- Greenhouse heating

Study objective

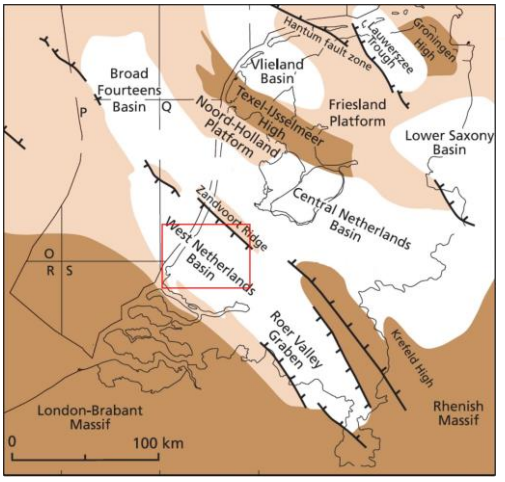
- Reduce economic risks for geothermal projects
  - Reduce uncertainties of reservoir characteristics

Geothermal energy in the Netherlands

- Doublets
- Closed system
- Injection and production well
- Six active doublets in the WNB



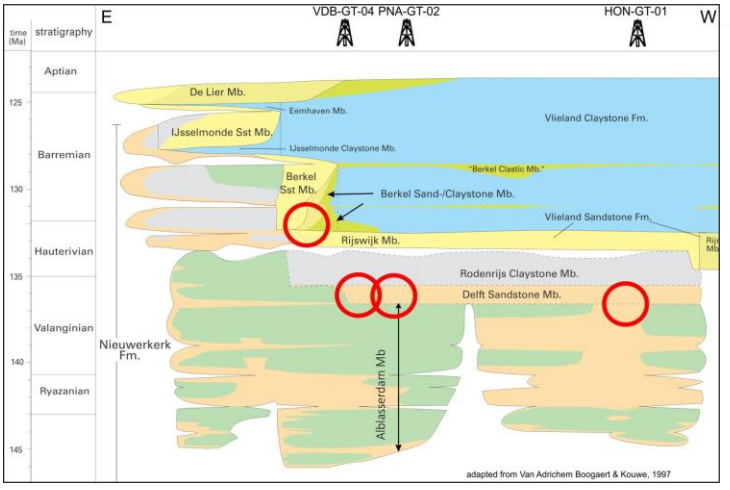
West Netherlands Basin



Modified from Herngreen and Wong,2007

- First doublet
- Cretaceous reservoir rocks
- Late Jurassic rifting
- Late Cretaceous inversion

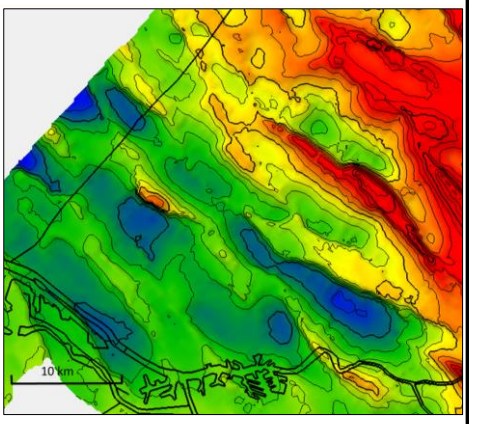
Stratigraphic scheme West Netherlands Basin



- Four important members
- Delft Sandstone main target
- In whole WNB a dominant sandstone

Nieuwerkerk Fm

- Fluvial deposits
- NW-SE trend
- Constrained by fault activity
- Occurs in all sub-basins



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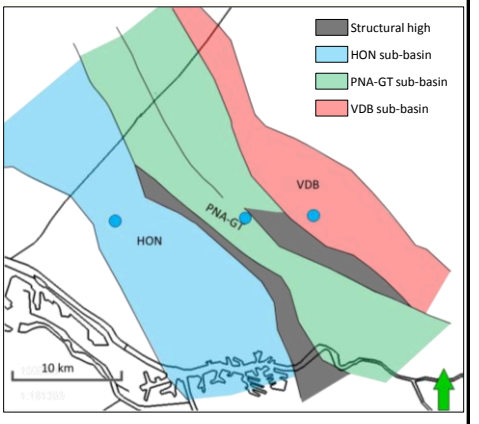
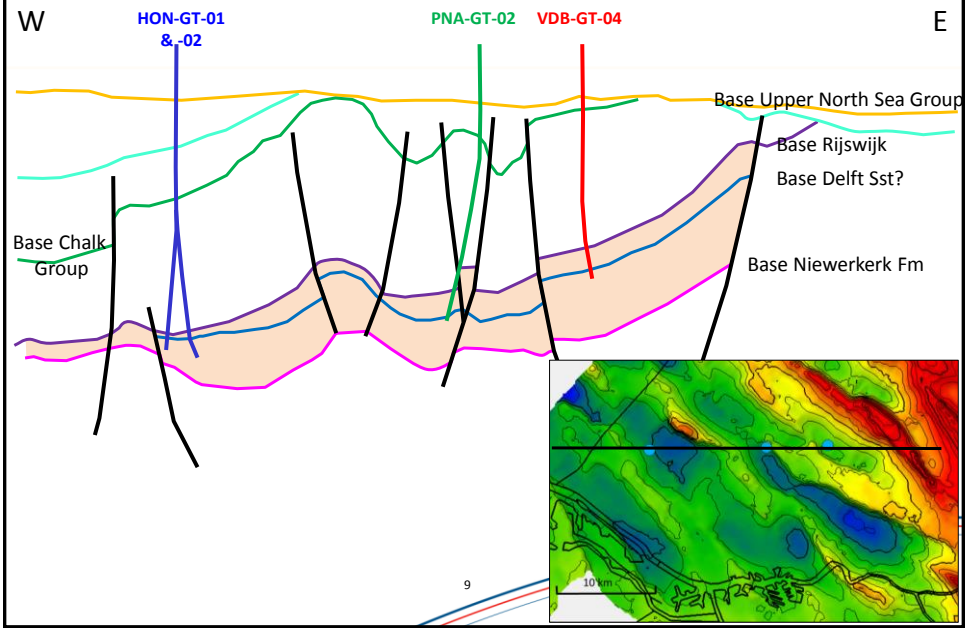
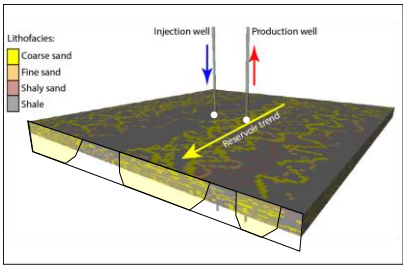


Cross section



Problem statement

- Current knowledge from structural highs
- Architecture of the fluvial Delft Sandstone reservoir is difficult to predict
- Economic risk depends on well placement



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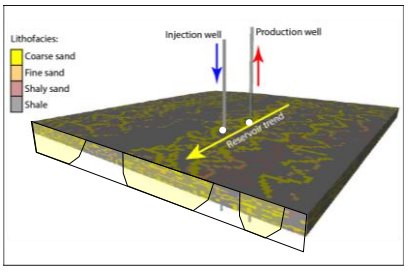
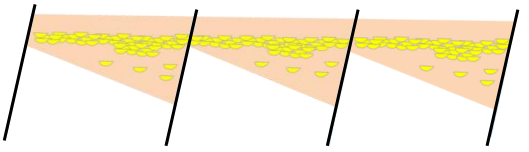


Stratigraphic correlations

- Biostratigraphical correlation:
  - Age
  - Depositional environment
- Well correlations
- Seismic correlations

Original hypotheses

Van Adrichem Boogaert & Kouwe, 1997

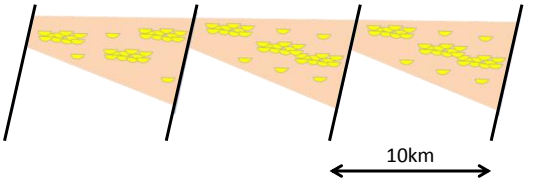


One continuous Delft Sst. in the WNB

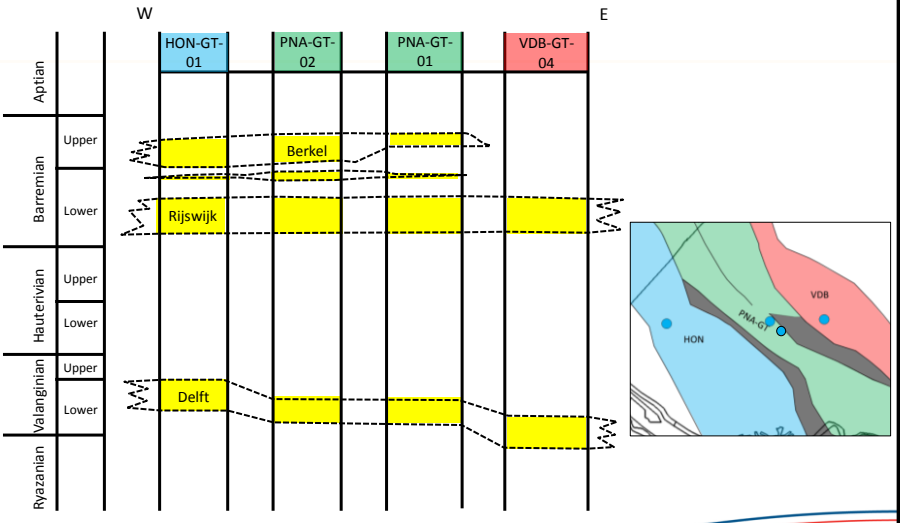
DeVault & Jeremiah, 2002

No Delft Sst.

Thick, stacked channel complexes in the WNB

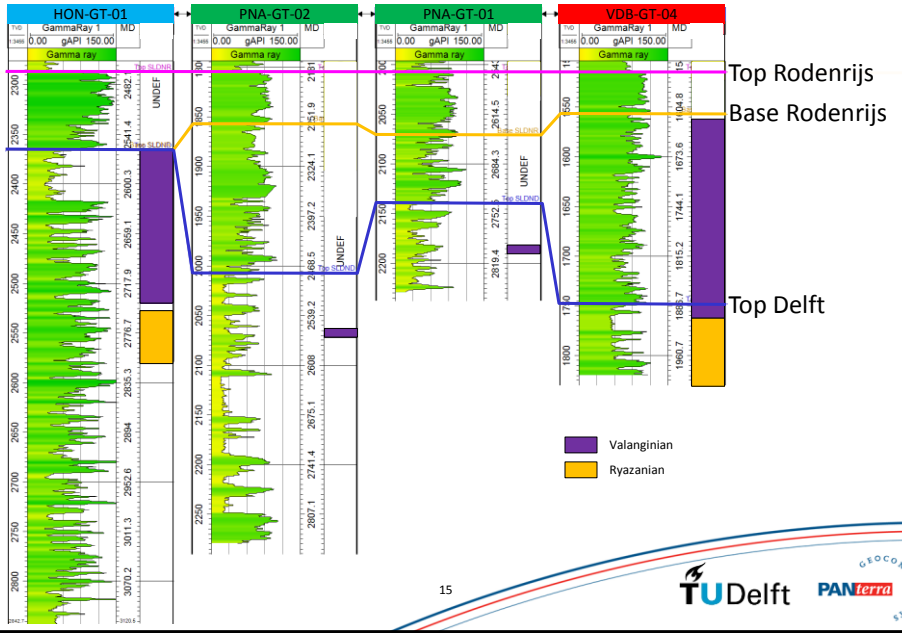


Preliminary dating results



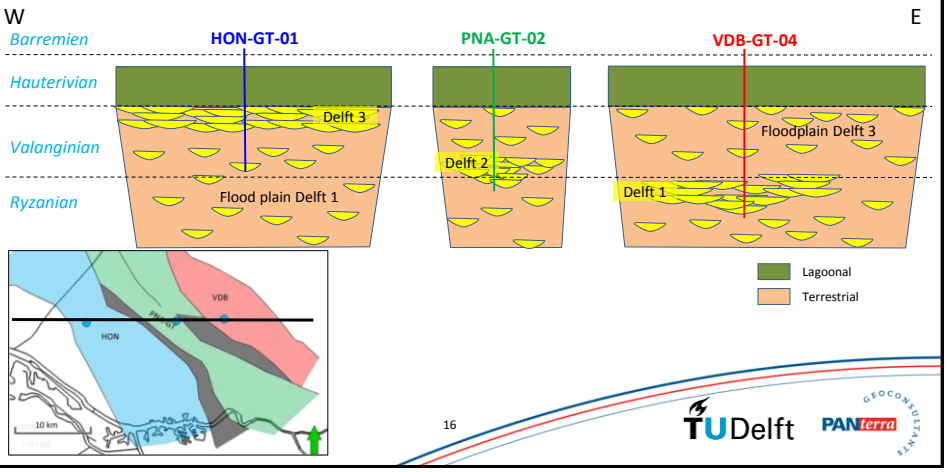
Biostratigraphical analyses done by TNO D.K. Munsterman

Well panel



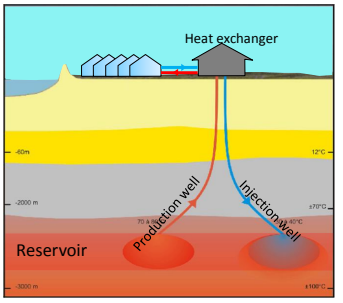
Conclusion - hypothesis

- Not one Delft Sandstone
- Fluvial system stepped from one sub-basin to the next



Geothermal implications

- Reduced uncertainties in reservoir characteristics important for economic risk reduction
  - Use reservoir characteristics from specific sub-basin
  - Placement of doublets in NW-SE direction



Next step

- Include new biostratigraphical data
- Include regional seismic interpretation
- Verify hypothesis with well data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Thank you